A Novel Microfluidic Device for Fully Automated Extraction of RNA from Cell Cultures, Phase II

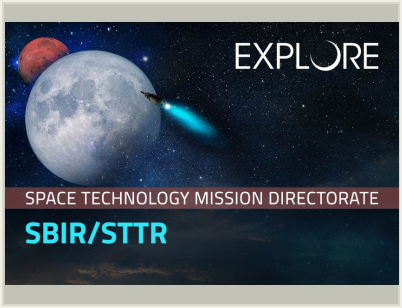
Completed Technology Project (2004 - 2006)

Project Introduction

Obtaining high quality, intact RNA from cells is an ubiquitous need in the pursuit of space biology. Our overall objective is to develop and commercialize a microfluidics based miniaturized platform (MED-RNA) that can fully automate the complex process of RNA isolation. Starting from harvested whole mammalian cells in a culture medium, MED-RNA will lyse, capture, and isolate RNA content for later analysis, in a fully integrated fashion with minimal user intervention. In addition to higher yields and faster process times, losses and contamination will be minimized as a result of the miniaturization and automation. A novel and unique plastic card based fabrication technology from Micronics Corp. will be leveraged for low-cost microfabrication. The Phase I study successfully demonstrated concept development and design of three critical aspects of the MED-RNA, (1) on-card reagent based cell lysis, (2) non-toxic electric field driven cell lysis, and (3) RNA capture and elution in a microfluidic extraction chamber. Physical prototypes of the components were fabricated and experimentally demonstrated. During Phase II, we will further optimize the individual component designs. Optimal components, along with necessary valving will be integrated on a plastic, microfluidic lab card. The fully integrated prototype lab card will be demonstrated on chosen cell lines. Further ensuring success, CFDRC has assembled an experienced, multidisciplinary team.

Anticipated Benefits

Potential NASA Commercial Applications: In the commercial sector, we will target users and applications of the developed device in basic pre-clinical/clinical research and the pharmaceutical/drug discovery process. In addition, a valuable by-product of this effort will be a well-validated simulation tool for the development of other microfluidic devices for cellular analysis.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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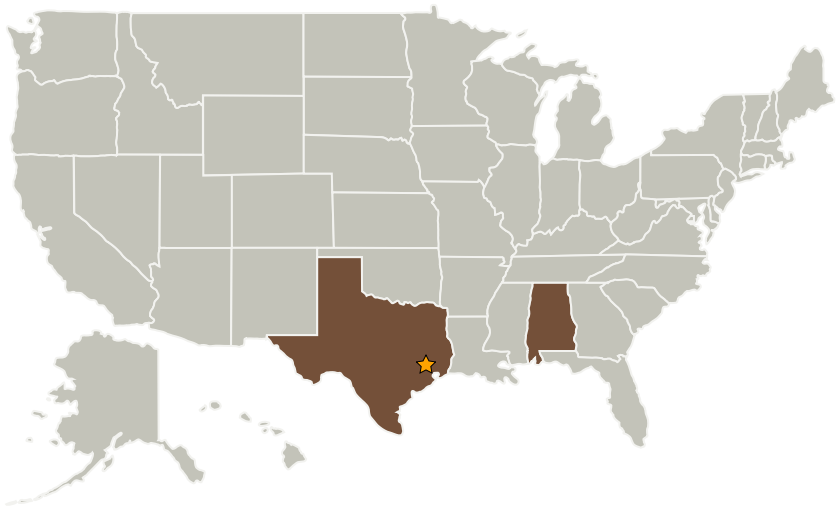
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Shankar Sundram

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.2 Intelligent Integrated Manufacturing